WEB APPENDIX

How Advertising Expenditures Affect Consumers' Perceptions of Quality

A Psychology-Based Assessment of Brand-, Category-, And Country-Level Moderators

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WEB APPENDIX 1 List of Brands in the Study

Category	Brands
Apparel and shoes	Adidas, American Apparel, Anne Klein, Asics, Athleta, Brooks Brothers, Calvin Klein, Champion, Coach, Columbia, Converse, Crocs, Dockers, Dr. Scholl's Shoes, Duluth Trading Co., Eddie Bauer, Fabletics, Fossil, Kenneth Cole, K-Swiss, Lee, Levi's, LifeStride, Liz Claiborne, London Fog, Lululemon, Marmot, Merrell, Michael Kors, Mudd, Naturalizer, Nautica, New Balance, New Era, Nike, Nine West, North Face, Oakley, Patagonia, Polo Ralph Lauren, Puma, Quiksilver, Reebok, Rockport, Sam Edelman, Skechers, SOREL, Teva, Timberland, Tommy John, TOMS, True Religion, UGG, Under Armour, Vans, Victorinox Swiss Army, Vineyard Vines, Wolverine, Wrangler
Appliances	Amana, Bissell, Bosch, Dyson, Electrolux, Fisher Paykel, Frigidaire, Gaggenau, GE, GE Profile, Gibson, Haier America, InSinkErator, Jenn-Air, Kenmore, Lennox, LG, Magic Chef, Maytag, Ninja, Samsung, Shark, Sub-Zero, Viking, Westinghouse, Whirlpool
Beverages: beer	Amstel, Anheuser-Busch InBev, Beck's, Blue Moon, Bud Light, Budweiser, Busch, Coors, Coors Light, Corona, Dogfish Head, Dos Equis, Fat Tire, Fosters, Guinness, Heineken, Heineken Light, Icehouse, Keystone, Michelob ULTRA, Mike's Hard Lemonade, Miller, Miller Lite, MillerCoors, Milwaukee's Best, Molson, Radeberger, Red Stripe, Redd's Apple Ale, Rolling Rock, Samuel Adams, Shock Top, Stella Artois, Yuengling
Beverages: soft drinks	7 Up, A&W, Canada Dry, Coca Cola, Coke Zero, Crush, Diet Coke, Diet Dr. Pepper, Diet Mountain Dew, Diet Pepsi, Dr. Pepper, Evian, Fresca, Mountain Dew, NOS, Pepsi, Pepsi Max, Powerade Zero, Red Bull, Sierra Mist, Sprite, Squirt, Sunkist
Beverages: spirits	Absolut, Aperol, Bacardi, Baileys, Bombay Sapphire, Canadian Club, Captain Morgan, Courvoisier, Crown Royal, Dewar's, Grey Goose, Hennessy, J&B, Jack Daniel's, Jagermeister, Jameson, Jim Beam, Johnnie Walker, Jose Cuervo, Maker's Mark, Martini & Rossi, Patron, Skyy, Smirnoff, Southern Comfort, Tanqueray, Wild Turkey
Cameras	Canon, Fuji, Kodak, Nikon, Olympus, Panasonic
Cars	Acura, Audi, BMW, Buick, Cadillac, Chevrolet, Chrysler, Dodge, Fiat, Ford, General Motors, GMC, Honda, Hyundai, Infiniti, Jaguar, Jeep, Kia, Land Rover, Lexus, Lincoln, Mazda, Mercedes, MINI, Mitsubishi, Nissan, Porsche, Subaru, Tesla, Toyota, Volkswagen, Volvo
Clothing stores	Abercrombie & Fitch, Aerie, Aeropostale, American Eagle, Ann Taylor, Anthropologie, Arden B., AVENUE, Banana Republic, Bealls, Bebe, Boohoo, Burberry, C. J. Banks, Cache, Catherines Plus Sizes, Charlotte Russe, Chico's, Christopher & Banks, CitiTrends, Claire's, Express, Forever 21, Gap, GapBody, Gucci, H&M, Hollister, Hot Topic, J. Crew, J. Jill, Jos. A. Bank, Juicy Couture, K&G Fashion Superstore, Lane Bryant, Limited, LOFT, Lucy, Maurice's, Men's Wearhouse, New York & Company, Old Navy, Ralph Lauren, Talbots, The Buckle, Tommy Hilfiger, Torrid, Uniqlo, Urban Outfitters, Victoria's Secret, VS Pink, Wet Seal, White House Black Market, Wilsons Leather, Zappos.com, Zara
Computer accessories	Brother, Casio, IBM, Intel, Lexmark
Consumer banks	Bank of America, Bank of New York, Bank of the West, Barclay's, BB&T, BMO Harris Bank, Capital One Bank, Chase, Citibank, Citizens Bank, Comerica, Fifth-Third, First Republic, Frontier Bank, HSBC, Huntington Bank, KeyBank, M&T Bank, PNC Bank, Rabobank, Regions Bank, SunTrust, TCF Bank, TD Bank, Umpqua Bank, Union Bank, U.S. Bank, Wells Fargo, Zions Bank
Consumer electronics: audio/visual	Aiwa, Apple, Beats by Dre, Bose, Harman Kardon, Hitachi, Jensen, JVC, Kenwood, LG, Nintendo Wii, Onkyo, Panasonic, Philips, Pioneer, RCA, Samsung, Samsung SHAPE, SanDisk, Sanyo, Sharp, Skullcandy, SOL Republic, Sonos, Sony, Toshiba, Vizio, XBox, Yamaha, Zenith
Consumer packed goods: coffee and tea	Canned Seattle's Best Coffee, Folgers, Green Mountain, Maxwell House, Nestea, Starbucks DoubleShot Energy+Coffee

WEB APPENDIX 1 List of Brands in the Study (continued)

Category	Brands
Consumer packed goods: dairies	Chobani, Coffee-Mate, Dannon, Earth's Best, Fage, Horizon Organic Milk, Land-O-Lakes (butter), Land-O-Lakes (cheese), Liberte, Noosa, Organic Valley, Stonyfield, Tillamook, Yoplait
Consumer packed goods: juices and mixes	Bai, Country Time, Crystal Light, Dole, Florida's Natural, Gatorade, Goya Coconut Water, Hubert's Lemonade, Lipton, Minute Maid, Motts, Powerade, Resource, Simply Orange, Snapple, Sun Drop, Trop50, Tropicana, V8, Vita Coco, ZICO
Consumer packed goods: other food products	General Mills, Mountain High, Mrs. Dash, Muir Glen, Splenda
Consumer packed goods: ready meals	Campbell's, DiGiorno, Giovanni Rana, Johnsonville Sausage, Maruchan Instant Lunch, McCormick, Nissin Cup Noodles, Nissin Top Ramen, Old El Paso, Ortega, Pacific, Progresso, Red Baron, Totino's Pizza Rolls, White Castle Frozen Sliders
Consumer packed goods: snacks and sweets	Annie's, Benecol, Betty Crocker, Bisquick, Chex, Dove (chocolate), Fiber One, Frito-Lay, Ghirardelli, Hershey's, Honey Bunches of Oats, Kashi, KozyShack, M&M's, Nabisco, Nestlé Toll House, PayDay, Peanut Chews, Pillsbury, Planters, Quaker, Reese's, Reese's Puffs, Snickers, Trolli
Consumer packed goods: water	Aquafina, Arrowhead, Dasani, Deer Park, Fiji, Ice Mountain, Ozarka, Perrier, Poland Spring, Propel, Zephyrhills
Credit cards	American Express, Capital One, Discover, MasterCard, Visa
Department stores	Bloomingdale's, Cost Plus World Market, Dillard's, J.C. Penney, Kohl's, Lord & Taylor, Macy's, Neiman Marcus, Nordstrom, Saks, Sears
Dining: casual dining	Applebee's, Bahama Breeze, BJ's, Buffalo Wild Wings, California Pizza Kitchen, Carrabba's, Chevys, Chili's, Famous Dave's, Golden Corral, HomeTown Buffet, Houlihan's, Joe's Crab Shack, Landry's Seafood House, Luby's, Old Country Buffet, Olive Garden, On The Border, Red Lobster, Red Robin, Romano's Macaroni Grill, Ruby Tuesday, Ryan's, Sizzler, Taco Cabana, Texas Roadhouse, TGI Friday's, The Cheesecake Factory, Tilted Kilt, Wingstop
Dining: fast casual dining	Backyard Burgers, Blimpie, Boston Market, Champps, Charley's Crab, Chick-fil-A, Chipotle, Chuck E. Cheese, Cici's Pizza, Cosi, Dave and Buster's, Denny's, Eat'n Park, El Pollo Loco, Elephant Bar, Five Guys, Friendly's Ice Cream, Frisch's Big Boy, Fuddruckers, Green Burrito, IHOP, Marie Callender's, O'Charley's, Panera Bread, Pei Wei Asian Diner, Qdoba, Steak 'n Shake, Taco Bueno, The Habit Burger Grill, Waffle House, Zaxby's
Dining: fast food	A&W, Arby's, Baja Fresh, Burger King, Captain D's, Carl's Jr., Chick-fil-A, Chipotle, Church's, Culver's, Dairy Queen, Del Taco, Hardee's, In-N-Out, Jack in the Box, Jimmy John's, KFC, Krystal, Long John Silver's, McDonald's, Nathan's Famous, Popeyes, Qdoba, Quiznos, Rubio's, Schlotzsky's, Subway, Taco Bell, Wendy's, Whataburger, White Castle, Wienerschnitzel
Dining: steakhouses and top casual dining	Black Angus, Bonefish, Buca di Beppo, Chart House, Fleming's, J. Alexander's, Kona Grill, Logan's Roadhouse, Lone Star Steakhouse, LongHorn Steakhouse, Maggiano's, McCormick & Schmick's, Morton's, Outback Steakhouse, P. F. Chang's, Rainforest Cafe, Ruth's Chris, Saltgrass Steakhouse, Smith & Wollensky, Smokey Bones BBQ & Grill, Texas Roadhouse, The Palm, Tony Roma's
Discount stores	Big Lots, Dollar General, Dollar Tree, Family Dollar, Hautelook, Kmart, Marshall's, Neiman Marcus Last Call, Nordstrom Rack, Saks Off 5th, Stein Mart, Target, TJ Maxx, Walmart
Drugs: Over-the-counter	Advil, Afrin, Airborne, Alavert, Alcon, Aleve, Alka-Seltzer, Allegra, AstraZeneca, Band-Aid, Bausch & Lomb, Bayer Aspirin, Benadryl, Benefiber, Bengay, Bio-Oil, Bristol-Myers Squibb, Centrum, Children's Motrin, Children's Tylenol, Citrucel, Claritin, Clear Eyes, CooperVision, Coricidin, DayQuil, Delsym, Durex, Emergen-C, Enfamil, Ensure, Excedrin, Flonase, Glucerna, Icy Hot, Imodium, Johnson & Johnson, Lactaid, Lamisil, Lotrimin, Maalox, Mederma, Merck, Metamucil, Motrin, Mucinex, Mylanta, Nasacort, Nature Made, Neosporin, NyQuil, One-A-Day, Pediacare, Pedialyte, PediaSure, Pepcid, Preparation-H, Refresh, Rhinocort, Robitussin, Rolaids, Salonpas, Similasan, Sudafed, Systane, Theraflu, Thermacare, Triaminic, Trojan, Tums, Tylenol, Visine, Xyzal, Zicam, Zyrtec, ZzzQuil

WEB APPENDIX 1 List of Brands in the Study (continued)

Category	Brands
Drugs: prescription	Acuvue, Nexium, SynergEyes, Zantac
Electronic devices: accessories	Belkin, Lifeproof, Otterbox
Financial services	Credit Karma, E*TRADE, Equifax, Experian.com, FreeCreditscore.com, LendingTree, LifeLock, Nationwide, Scottrade, TD Ameritrade, Transunion
Investment management	Blackrock (iShares), Charles Schwab, Edward Jones, Fidelity, Franklin Templeton, Goldman Sachs, J. P. Morgan, Janus, Merrill Lynch, Morgan Stanley, Oppenheimer, PIMCO, Prudential, Putnam, T. Rowe Price, TIAA, UBS, USAA, Vanguard, Voya Financial, Wells Fargo ADVISORS
Internet service provider and cellular services	AT&T, Consumer Cellular, Cricket Wireless, EarthLink, Sprint, T-Mobile, US Cellular, Verizon Wireless
Payment systems	MoneyGram, PayPal, Paysafe, Paysafecard, Skrill, Western Union
PCs and laptops	Acer, Apple, Dell, Gateway, HP, Lenovo, Sony, Toshiba
Restaurants: pizza stores	Domino's, Donatos, Giordano's, Godfather, Little Caesar's, Old Chicago Pasta & Pizza, Papa John's, Papa Murphy's, Pizza Hut, Round Table Pizza
Shops/restaurants: coffee and donuts	Caribou Coffee, Dunkin', Einstein Bagels, Krispy Kreme, Noah's Bagels, Peet's Coffee, Seattle's Best, Starbucks, Tim Horton's
Shops/restaurants: ice cream-smoothies	Baskin-Robbins, Cold Stone Creamery, Jamba Juice, Orange Julius, Pinkberry, Red Mango, Smoothie King, Tropical Smoothie
Smart home devices and systems	ADT, Amazon Alexa, Amazon Echo, Amazon Fire TV Stick, August, Eero, Google Home, Nest, Roku
Software and apps	Adobe, Android, Electronic Arts, McAfee, Microsoft, Mozilla, Norton, Quicken, SiriusXM, Skype, Symantec, Windows
Tablets and phones	BlackBerry, HTC, Kindle, LG, Motorola, Nexus, Nokia, Nook, Samsung
Tools and hardware	Black & Decker, Bosch, DeWalt, Dremel, Hilti, Husky, Husqvarna, Jet, John Deere, Lincoln Electric, Makita, Milwaukee, Ridgid, Ryobi, Sherwin Williams, Stanley, Starrett, Toro, Valspar, Wagner
Travel: airlines	Aeromexico, Air Canada, Air France, Alaska Air, Alitalia, American Airlines, British Airways, Delta, EasyJet, El Al, Emirates, Frontier, Hawaiian Airlines, JetBlue, KLM, Lufthansa, Norwegian, Qantas, Singapore Airlines, Southwest, Spirit Airlines, United, Virgin Atlantic
Travel: amusement, theme, and water parks	Busch Gardens, Cedar Point, Colonial Williamsburg, Disneyland/Disney World, Great Wolf Lodge, Kalahari, Knott's Berry Farm, Sea World, Six Flags, Universal Studios
Travel: cruises	Carnival Cruise Line, Celebrity Cruises, Holland America Line, Norwegian Cruise Lines, Princess Cruises, Royal Caribbean Cruises
Travel: ground transportation	Amtrak, Greyhound, Lyft, Uber, Zipcar
Travel: hotels	Airbnb, Andaz, Best Western, Comfort Inn, Courtyard by Marriott, Crowne Plaza, Days Inn, Doubletree, Econo Lodge, Embassy Suites, Four Seasons, Grand Hyatt, Hampton Inn, Hilton, Hilton Garden Inn, Holiday Inn, Holiday Inn Express, HomeAway, Homewood Suites, Hotel Indigo, Hyatt, Hyatt Centric, Hyatt House, Hyatt Place, Hyatt Regency, Intercontinental Hotels, Kimpton Hotels & Restaurants, La Quinta Inn, Mandarin Oriental, Marriott, Motel 6, Omni Hotels, Park Hyatt, Radisson, Ramada, Red Roof Inn, Residence Inn, Ritz-Carlton, Shangri-La, Sheraton, Springhill Suites, Super 8 Motels, The Peninsula, TownePlace Suites, Trump Hotels, W Hotels, Waldorf-Astoria, Westin, Wyndham Hotels & Resorts
Travel: online travel agencies	Alamo, American Express Travel, Avis, Booking.com, Budget, CheapTickets, choicehotels.com, Dollar, Enterprise, Expedia, Hertz, Hotels.com, Hotwire.com, National, Orbitz, Priceline.com, Thrifty, Travelocity, travelzoo.com, Tripadvisor, Trivago

WEB APPENDIX 2 Mturk Survey

For the survey that the authors conducted in May 2019 to measure product category involvement, purchase frequency, and new product introduction frequency in different categories, they recruited participants from Amazon Mechanical Turk (Mturk) after receiving institutional review board (Georgia Institute of Technology) approval. To participate, survey respondents had to be at least 21 years old, communicate effectively in English, reside in the United States, and be in the United States at the time of the completion of this survey. Additionally, to enhance the quality of the survey, the authors only hired Mturkers who had "masters qualifications" and whose approval rating exceeded 95 percent. To ensure that the respondents were providing useful responses, the authors included an "attention check" item that involved simple mathematical calculation (e.g., 117 – 10). They also included a Captcha box that the respondents had to click on to demonstrate that they were not "robots." On average, 49 respondents completed the survey for each category (39 was the minimum number of respondents for a category) in exchange for monetary compensation. Forty-one percent of respondents were female, 58 percent were male, and about one percent did not specify their gender or chose "other." The sample age ranged from 21 to 76 years, with an average of 35 years, which is similar to the U.S. population.

WEB APPENDIX 3 Correlations between Interaction Terms

Variable	AD × OWN	AD × VOLATIL	AD × EQUITY	AD × INVOLV	AD × CATAGE	AD × NPL	AD × FREQ	AD × GDPPC
AD × OWN	—							
AD × VOLATIL	.05	—						
AD × EQUITY	.34	–.06	—					
AD × INVOLV	–.18	–.10	.07	—				
AD × CATAGE	–.03	.06	–.03	.19	—			
AD × NPL	.11	–.02	.21	.29	.00	—		
AD × FREQ	–.27	–.08	.04	.70	.10	–.04	—	
AD × GDPPC	–.01	–.02	.08	.01	.02	.05	–.01	—
FREQ	.01	.14	–.29	–.10	.07	.66	.06	–.17
GDPPC	.00	.04	–.04	.02	–.01	.00	.01	.01

Note: AD = advertising expenditures; OWN = ownership; VOLATIL = advertising volatility; EQUITY = brand equity; INVOLV = product involvement; CATAGE = product category age; NPL = new product launch frequency; FREQ = purchase frequency; GDPPC = gross domestic product per capita. The only correlation in the above table that seems alarming is .70 between AD × INVOLV and AD × FREQ. To make sure that the authors' estimated coefficients for AD × INVOLV and AD × FREQ in their analysis (i.e., Model 1.3) are not affected by multicollinearity, they ran separate analyses by removing INVOLV and AD × INVOLV in one analysis and FREQ and AD × FREQ in another. In both analyses, results were substantively similar to the authors' main findings.

WEB APPENDIX 4 Robustness Checks

The authors conducted several robustness checks to assess the validity of their findings. To address endogeneity concerns in their main analysis (i.e., M1.3), they constructed a control function based on an independent variable (i.e., COMP). In model R1.1, they replicate the findings of M1.3 by reconstructing the control function using the Gaussian copula approach.

Advertising expenditures in the previous months could be driving some of the findings. To rule this out, the authors also included lagged advertising expenditures for the past three periods. The results are reported in R1.2 and are in line with the main findings. The authors also tried different numbers of lags. In all cases, the substantive findings remained the same.

In model M1.3, the authors account for inherent differences across brands using brand-specific random effects (i.e., u_i). The existence of brand- and category-level time-invariant moderators in the authors' analysis does not allow them to include brand fixed effects in their main analysis. As a robustness check, the authors added 504 parent company fixed effects (Model R1.3). The results are qualitatively similar to the authors' main findings.

Unobserved category-level covariates could influence the authors' findings regarding the moderators of interest. For example, the effect of advertising expenditures on perceived quality could be different for credence goods versus experience goods. This omitted variable could, in turn, affect the coefficient estimates

for the authors' moderating variables (*i.e.,* β_3 through β_{10}). To address such concerns, the authors conducted two robustness checks. First, in R1.4 they included 27 sector fixed effects. Note that the variation across category-level variables such as *INVOLV* or *NPL* comes from 48 categories and, hence, after including 27 sector fixed effects, the interaction effects are still identified. Alternatively, in R1.5, the authors specified a hierarchical linear model that accounts for the similarity of within-category observations using an additional random effect parameter. Both analyses support the authors' substantive findings.

In R1.6, the authors log-transform the dependent variable (*i.e.,* perceived quality). Because perceived quality ranges from –29.28 to +68.88, to avoid negative values, the authors added 30 to *all perceived quality* values before applying the log-transformation. The results reported in R1.6 support the authors' main findings. Unlike previous analyses, R1.6 provides support for the authors' hypothesis that advertising expenditures will have a stronger impact on perceived quality in newer categories. In R1.7, the authors control for a brand's level of awareness. The majority of their findings are robust to these additions.

Covariate	M1.3	R1.1: M1.3 with Control Function based on Copula	R1.2: M1.3 + Three Lags of AD	R1.3: M1.3 + Parent Company FEs	R1.4: M1.3 + Sector FEs	R1.5: M1.3 + Category-Specific RE	R1.6: M1.3 with Log-Transformed PQ	R1.7: M1.3 + Brand Awareness
AD	.283***	.120†	1.043**	.319†	.321***	.321***	.006***	.191***
Interactions								
AD × *VOLATIL*	–.005**	–.006**	–.004*	–.005**	–.005**	–.005**	–.001*	–.003*
AD × *OWN*	.064†	.064†	.062†	.065†	.065†	.064***	.001*	.040†
AD × *EQUITY*	–.112**	–.113**	–.111*	–.112**	–.114**	–.113**	–.002**	–.080*
AD × *INVOLV*	–.104**	–.104**	–.105**	–.103**	–.104**	–.105*	–.003**	–.061**
AD × *FREQ*	.037	.039	.035	.036	.037	.038	.001	.019
AD × *CATAGE*	.034	.034	.030	.035	.032	.033	.002**	.014
AD × *NPL*	.084***	.080***	.088***	.080**	.083***	.082**	.002**	.066***
AD × *GDPPC*	1.486**	1.407*	1.437**	1.484**	1.487**	1.486*	.045**	1.048**
Main Effects	Included	Included	Included	Included	Included	Included	Included	Included
Month FEs	Included	Included	Included	Included	Included	Included	Included	Included
Brand RE	Included	Included	Included	Included	Included	Included	Included	Included
Control Function	Included	Copula	Included	Included	Included	Included	Included	Included
Three lags of *AD*			Included					
505 Parent company FEs				Included				
27 Sector FEs					Included			
Category-Specific RE						Included		
Intercept	15.487†	15.437†	15.833†	15.440†	13.807†	15.455†	3.780†	7.266†
Number of observations	43,081	43,081	43,081	43,081	43,081	43,081	43,081	43,081
Number of brands	898	898	898	898	898	898	898	898

Note: FEs = fixed effects; RE = random effect; *AD* = advertising expenditures; *VOLATIL* = advertising volatility; *OWN* = ownership; *EQUITY* = brand equity; *INVOLV* = product involvement; *FREQ* = purchase frequency; *CATAGE* = product category age; *NPL* = new product launch frequency; *GDPPC* = gross domestic product per capita. *$p < .10$; ** $p < .05$; ***$p < .01$; $^{\dagger}p < .001$ (significance assessed with brand cluster-adjusted standard errors).